

CF substituted acridine, azobenzene, substituted azobenzene, fluorene, substituted fluorene, fluorenone, substituted fluorenone, carbazole, substituted carbazole, N-alkylcarbazole, dibenzofuran, substituted dibenzofuran, phenanthrene, substituted phenanthrene, pyrene and substituted pyrene, and the substitutions thereof are at least one group selected from alkyl, aryl, halogen, alkoxyl, nitro, aldehyde, cyano, amide, dialkylamino, sulfonamide, imide, carboxylic acid, carboxylic acid ester, sulfonic acid, sulfonic acid ester, alkylamino, and arylamino.

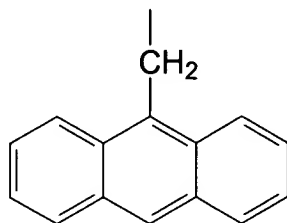
Remarks

Claims 1-31 were pending in the present application. Of these, claims 13, 15, 21, 27 and 29 were withdrawn from consideration as a result of a restriction requirement. Applicants thank the examiner for rejoining some of the claims of the original restriction requirement. Presently, the claims are restricted to those of Group I as set forth in the Official Action mailed 11/28/2001, i.e., claims 1-12, 14, 16-20, 22-26, 28, and 30-31. **Applicants respectfully request the Examiner to add claims 15 and 21 (belonging to Group III) to this Group I** as claims of both groups have a blocked isocyanate. It is respectfully submitted that the repeat unit "o" of General Formula II, II', and II" is also a blocked isocyanate group (as is the repeat unit "r" of claims 15 and 21) and as such, the polymers of both Group I and Group III have a blocked isocyanate, and should therefore be examined together in the present Application.

In the present Amendment, claims 16, 17, and 19 have been amended, new claims 32-37 have been added, and claims 13, 27, and 29 have been canceled without prejudice. All of the amendments and new claims are fully supported by the specification as filed, and it is believed that no new matter has been added. **A marked up version of the amendments to the specification and claims is attached.** A list of the pending claims (including claims 15 and 21) after entry of the present amendments is also included as an **Appendix**.

The Examiner's clarification is requested with regard to her statement on page 8 (part F), wherein she states that claims 4, 10, 20, and 31 have not been addressed and considered drawn to a non-elected invention, alleging these claims are not directed to an elected species of claims 2 and 3. Applicants respectfully disagree

with this statement. Applicants elected in claim 2 the species wherein D=9-anthracyl-, which is bonded through a CH₂ group to oxygen (Applicants clarify that the phrase "9-anthracenemethyl" having the structure below should have been used instead of "anthracyl-9-methyl" for D in Applicant's elected species for claim 2. It is hoped that this did not cause any confusion, and that the Examiner understood what the Applicants meant; this appears to be the case).



9-anthracenemethyl group

Claim 4 is directed to the limitations of the D group, and includes anthracene and substituted anthracene, and also includes (since it is dependent on claim 2 or 3) the limitation (in claims 2 and 3) that D is bonded (to nitrogen or oxygen) directly or through an alkylene (e.g. CH₂) group. Therefore, it is respectfully submitted that **Applicants' elected species from claim 2 falls squarely within the scope of 4.** Similarly, **Applicant's elected species from claim 2 also falls squarely within the scope of claims 20** (dealing only with limitations of D), **and 31** (with R₆=CH₃ for elected species). Applicants agree with Examiner that Applicant's elected species from claim 2 is outside the scope of claim 10 (where Z=ND, and Applicants chose Z=O in the elected species).

It is the Applicants' understanding that upon the examination of the elected species, the Examiner will extend the search to other compounds covered by the claims, and that the present claims do not therefore have to be limited to the elected species unless the finding of any additional prior art would preclude the allowance of such claims. In this regard, clarification from the Examiner with regard to her comments on page 9 (point #8) would be appreciated.

Claim Rejections under 35 U.S.C. §112

The Examiner has rejected claims 22-24, and 26 under 35 U.S.C. 112, second paragraph, as allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The Examiner has sought clarification with regard to the phrase "polymer of claim 2 or 3 having isocyanate groups". This phrase simply refers to the fact that the polymer structure of claim 2 or 3 must contain a pendant isocyanate group in the repeat unit "m", as shown. Applicants do not mean to imply that an unreacted vinyl monomer has to be present in the polymer, but that the polymer must contain the recurring/repeat unit "m" in the polymer structure, i.e., "m" cannot be zero in claim 22. It is respectfully submitted that one of ordinary skill in the art will find that claim to be clear as written, and that no amendment to the claim is necessary.

The Examiner has also objected to the recitation of both "proportion of total molar numbers" and "% by weight" in claim 16. This objection is deemed overcome in view of the present amendment to claim 16, which now refers to the composition by mol% (i.e., mole%).

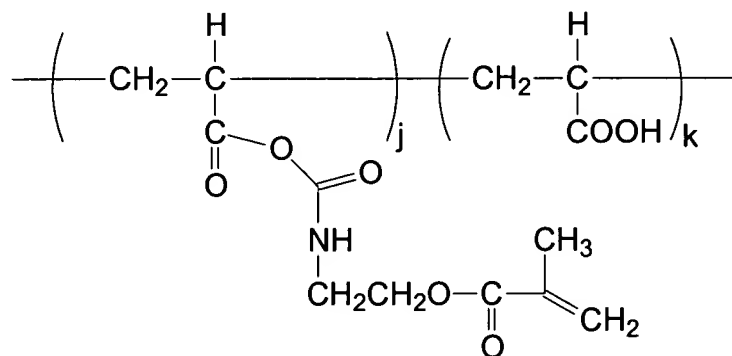
In view of the above arguments and amendments, the present rejection under 35 U.S.C. 112 is deemed overcome.

Claim Rejections under 35 U.S.C. §102**Li**

The Examiner has rejected claims 1, 2, 3, 17-19, 25, and 28 under 35 U.S.C. 102 (b) as allegedly being anticipated by PCT Patent Application WO 9634316, inventors Li et al. [hereinafter "Li"]. The Examiner asserts that the polymer as disclosed in Examples 4-6 on pages 17-18 of Li anticipates the limitations of claim 1-3, 17-19, when m and n are greater than zero, and o, p, q are zero, and R₂ is COOH. Applicants respectfully disagree with the position taken by the Examiner and traverse this rejection.

Li discloses a photosensitive composition comprising a reactive acid functional polymer and a photoinitiator which initiates crosslinking of the reactive, acid functional polymer upon exposure to radiation. Page 17-18, Examples 4-6 disclose the reaction of polyacrylic acid with isocyanatoethyl methacrylate (IEM). **The resulting product,**

however, is not a copolymer of acrylic acid and IEM (the IEM is not polymerized), as the Examiner appears to assert, but rather appears to be a polymer wherein some of the acid functionality (-COOH groups) of polyacrylic acid is reacted with the isocyanate functionality (-N=C=O) of IEM to presumably result in a structure (with a-C(O)OC(O)NH- functionality) as shown below:



Such a structure clearly does not contain the repeat unit "m" containing a pendant isocyanate group, as presently claimed. On page 18 lines 1-2 of Li, it is clearly stated that "the completion of the reaction is monitored by the disappearance of NCO band around 2300 cm⁻¹". Table 1 on page 18 (column 7: "Unsat., ephr") also indicates substantial amounts of unsaturation (from the methacrylate double bond), indicating that the IEM is not polymerized. In view of the above, it is clear that the polymer of Li does not anticipate the present claims. The present rejection should therefore be withdrawn.

Cumming

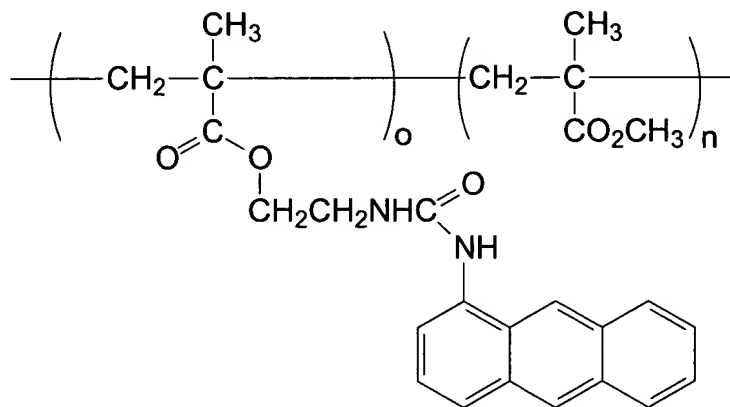
The Examiner has rejected claims 17 and 18 under 35 U.S.C. 102 (b) as allegedly being anticipated by U.S. Patent No. 5,414,069, inventors Cumming et al. [hereinafter "Cumming"]. The Examiner has cited Cumming for allegedly teaching a polymer of (9-anthracenemethoxycarbonyl)aminoethyl (me)thacrylate in col. 10. The Examiner asserts that this polymer meets the limitations of the elected species for claims 17 and 18, using the elected species for claim 2, when m, n, p, q are 0 and o is greater than 1.

This rejection is overcome in view of the present amendment to the claims. The amendatory "further provided" language (conditions (1) and (5)) of claim 17 now

specifies that when the repeat unit "m" is present, the repeat unit "p" (condition 4), the repeat unit "q" (condition 1), the repeat unit "o" (condition 5) or the repeat units "n" and "o" (condition 6) must also be present in the polymer. **Support for the amendatory language can be found throughout the specification, including specifically Synthesis Example 3, and Examples 1-1b to 1-1h, 2-1b to 2-1h, 3-3b to 3-3d, 3, 4, 9, 10, and 11-14.**

Condition (1) (m and q are both greater than 0 (zero) is supported by Synthesis Example 3 (pages 25-26) which discloses the use of the copolymer of 2-methacryloyloxyethyl isocyanate and maleic anhydride, the former leading to repeat unit "m", the latter to repeat unit "p". Thus Synthesis Example 3 discloses that both "m" and "q" must be greater than 1.

Condition (2) (n and o are both greater than 0) is supported, for example by Examples 3, 4, 9, 10, and 14. For example, Example 3 (pages 31-32) discloses the use of the reaction product 1-aminoanthracene with poly(2-methacryloyloxyethyl isocyanate-co-methyl methacrylate), which reaction product would be represented by the structure



Similarly, Example 4 (pages 32-33) discloses the reaction of 9-hydroxymethylantracene with poly(2-methacryloyloxyethyl isocyanate-co-methyl methacrylate).

Condition (3) (n and p are both greater than 0) is supported for example by Example 12 (pages 39). This Example discloses the use of the copolymer poly(methyl methacrylate-co-9-methylantracene methacrylate), the repeat unit from the first

comonomer being represented by "n" and the repeat unit from the second one being represented by "p".

Condition (4) (m and p are both greater than 0) is supported, for example, by Example 11 (pages 38-39), disclosing the copolymerization of methacryloyloxyethyl isocyanate (the repeat unit of which monomer is represented by "m") and 9-anthracenemethyl methacrylate (the repeat unit of which monomer is represented by "p").

Condition (5) (m and o are both greater than 0) is supported, for example, by Examples 1-1b to 1-h (pages 27-28), 2-1b to 2-1h (page 30), and 3-3b to 3-3d (pages 31-32). For example, Examples from 1-1b to 1-1h disclose the reaction products of 1-aminoanthracene (1-AA) with poly(2-methacryloyl-oxyethyl isocyanate) with a various mole % of 1-AA. Since not all of the isocyanate functionality/group is reacted with 1-AA in these particular examples (i.e., 1-AA is not reacted at equimolar amounts with respect to the isocyanate functionality in these examples), some of the isocyanate functionality remains in the polymer, represented by the repeat unit "m" having an isocyanate group, resulting in the condition that both m and n are greater than 0.

Condition (6) (m, n, and o are all greater than 0) is supported, for example, by Examples 13 and 14. For example, Example 13 (pages 39-41) discloses the terpolymer of N-methacryloyloxyethyl-9-methylanthracene carbamate (the repeat unit from which monomer is represented by "o"), methyl methacrylate (the repeat unit from which monomer is represented by "n") and 2-methacryloyloxyethyl isocyanate (the repeat unit from which monomer is represented by "m").

Cumming does not teach a copolymer that meets one of the five conditions as presently set forth in amended claim 17. This rejection is therefore deemed overcome.

Uytterhoeven

The Examiner has rejected claims 17-19 under 35 U.S.C. 102 (b) as allegedly being anticipated by U.S. Patent No. 4,663,265, inventors Uytterhoeven et al. [hereinafter "Uytterhoeven"]. The Examiner has cited Uytterhoeven for allegedly teaching the polymer (col. 9, preparation 8) isocyanatoethyl methacrylate/methyl methacrylate, which the Examiner asserts meets the limitations of claims 17 and 19 for

the elected species of claims 2 and 3 when m and n are greater than 0, and o, p, q are 0.

This rejection is overcome in view of the present amendment to claim 17. The disclosure of Uytterhoeven does not meet the limitations of amended claim 17. Conditions (5) of amended claim 17 requires that when "m" and "n" are present, "o" must also be present and that "m", "n", and "o" must all be greater than 0. Preparation 8 of Uytterhoeven does not contain the repeat unit "o". Therefore, this rejection is deemed overcome.

Foss

The Examiner has rejected claims 17-19 under 35 U.S.C. 102 (b) as allegedly being anticipated by U.S. Patent No. 5,266,651, inventors Foss et al. [hereinafter "Foss"]. The Examiner has cited Foss for allegedly teaching (col. 13, procedure B) the homopolymer of isocyanatoethyl methacrylate, asserting that this polymer meets the limitations of claims 17-19 for the elected species of claims 2 and 3 when m is greater than 0 and n, o, p, q are 0.

This rejection is overcome in view of the present amendment to claim 17. The disclosure of Foss does not meet the limitations of amended claim 17, which requires that when "m" is present, "q" or "p" or "o" or both "n" and "o" must also be present. Foss does not disclose the presence of "q" or "p" or "o" or both "n" and "o" repeat units along with "m". Therefore, the present rejection is deemed overcome.

Claim Rejections under 35 U.S.C. §103

Li

The Examiner has rejected claim 16 under 35 U.S.C. 103 (a) as being unpatentable over Li, cited above. This rejection is based on the Examiner's assertion/assumption that Li teaches a copolymer of isocyanatoethyl methacrylate and acrylic acid, and considers the recitation of the proportion of total molar numbers of monomer units of the polymer to be obvious through routine experimentation. Applicants respectfully disagree with the position taken by the Examiner and traverse this rejection.

Applicants have already argued above (arguments under 102 rejection) that Li does not teach a copolymer of isocyanatoethyl methacrylate and acrylic acid. Therefore the polymer of claim 16 is neither taught nor suggested by Li, and the rejection should be withdrawn.

Li in view of Nishi

The Examiner has rejected claim 14 under 35 U.S.C. 103 (a) as being unpatentable over Li, cited above, in view of U.S. Patent NO. 6,048,661, inventors Nishi et al. [hereinafter "Nishi"]. This rejection is based on the Examiner's assumption that Li teaches a radiation sensitive composition comprising a copolymer of isocyanatoethyl methacrylate and acrylic acid. The Examiner's has cited Nishi for allegedly teaching that the addition of a base additive, such as aliphatic amines to a radiation sensitive composition comprising a photoacid generator (PAG) improves pattern resolution. The Examiner asserts that it would have been obvious to one of ordinary skill in the art to add a free amine to the composition of Li with a reasonable expectation of obtaining a radiation sensitive composition. Applicants disagree with this assumption and traverse this rejection.

Applicants have already argued above (arguments under 102 rejection) that Li does not teach a copolymer of isocyanatoethyl methacrylate and acrylic acid. The premise for the Examiner's rejection is therefore incorrect. Accordingly, even if Li and Nishi were combined in the manner as proposed by the Examiner, one would not arrived at the invention as claimed by claim 14. This rejection should therefore be withdrawn.

Claim Objections

The Examiner has objected to claim 16 under 35 CFR 1.75 (c), as allegedly being of improper dependent form for failing to further limit the subject matter of a previous claim. She has objected to the recitation of "and/or blocked derivatives thereof" in claim 16, as broadening the invention of claim 1. Applicants have amended claim 16 to delete said recitation, as suggested by the Examiner.

The Examiner has also objected to claims 5-12, and 30 for the informality that while they have allowable subject matter directed to the elected species, they are not yet limited to the elected species. As explained under "Remarks" above, Applicants do not believe that these claims have to be rewritten to limit their scope to the elected species, and it is expected that the Examiner, after examining the elected species, will go ahead and extend the search to cover other embodiments beyond the elected species that are still within the scope of these claims. Applicants therefore expect that these claims will be allowed in their present form, unless there is prior art that would preclude such allowance.


New claims

The subject matter of original claim 16 has been claimed in new claim 32, an independent claim which includes blocked derivatives of General Formula II. The phrase "blocked derivative" is meant to cover any blocked derivative, including blocked structures beyond repeat unit "o" (also a blocked derivative), such as the repeat unit "r" in General Formula (V), claimed in claims 15 and 21. Applicants would consider deleting claim 32, if the Examiner would examine claims 15 and 21 in the present application. New claims 33-37 are directed to certain preferred embodiments of the original claims, and believed to be within the scope of the elected invention (claims of Group I).

CONCLUSION

The above is believed to be a complete response to the Official Action mailed 11/28/2001. The issuance of a Notice of Allowance is respectfully requested. If minor issues remain to be resolved, a telephone call to the undersigned is suggested.

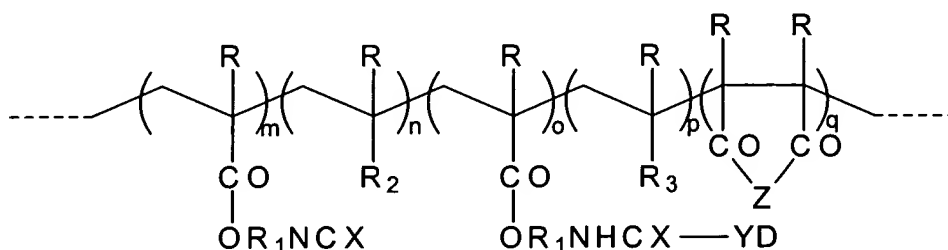
Respectfully submitted,


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Version with markings to show changes made

16. (Thrice amended) A composition for an anti-reflective coating or a radiation absorbing coating containing the polymer of claim 1, **[and/or blocked derivatives thereof,]** wherein the proportion of total molar numbers of monomer units of polymer which have isocyanate group, thioisocyanate group or blocked derivatives thereof to total molar numbers of monomers and monomer units of polymers in the composition is 0.1 to 40 mol% **[by weight]**.

17. (Once amended) A polymer as represented by the following General Formula II.
General Formula II



wherein

R is a hydrogen atom or an alkyl group; R₁ is an alkylene group, a substituted alkylene group, a cycloalkylene group, a substituted cycloalkylene group, a phenylene group or a substituted phenylene group; R₂ is a phenyl group, -COOH, a halogen atom, a cyano group, an alkoxyl group or -COOR₆ in which R₆ is a substituted or non-substituted, alkyl or aryl group or an ethylacetoacetate group; R₃ is -COOD; D is an organic chromophore which absorbs the exposed wavelength (100-450 nm) and represents a substituted or non-substituted, benzene ring, condensed ring or heterocyclic ring bonded directly or through alkylene group; X is O or S; Y is O or NR₄ group in which R₄ is either a hydrogen atom or a substituted or non-substituted, phenyl group or cyclic, linear or branched alkyl group; Z is O, ND group or NR₅ group in which R₅ is either a hydrogen atom or a substituted or non-substituted, phenyl group or cyclic, linear or branched alkyl group; and n, p and q are simple integers including zero and m and o are also simple integers including zero while at least one of them is greater than zero; further provided that at least one of the following conditions is met : (1) m and q

are both greater than 0; (2) n and o are both greater than 0; (3) n and p are both greater than 0; (4) m and p are both greater than 0; (5) m and o are both greater than 0; and (6) m, n, and o are all greater than 0.

19. (Once amended) A polymer according to claim 17, wherein R is a hydrogen atom or a methyl group, R_1 is an ethylene group, X is an oxygen atom, Y is $-NR_4$ group in which R_4 is either a hydrogen atom or a substituted or non-substituted, phenyl group or cyclic, linear or branched alkyl group, D is an organic chromophore which absorbs the exposed wavelength (100-450 nm) and represents a substituted or non-substituted, benzene ring, condensed ring or heterocyclic ring bonded directly or through an alkylene group, and n, p and q are simple integers including zero and m and o are also simple integers including zero while at least one of them is greater than zero.